

Thermowell in ScrutonWell® design

WIKA data sheet SP 05.16

Applications

- Petrochemical industry, on/offshore, plant construction
- For highest process loads
- Application in critical measuring points

Special features

- Thermowell with vibration reduction according to Scruton (Patent, property right: PCT/EP2019/071397)
- The damping of vibrational excitation by helical strakes is a recognised state of the art in a wide variety of industrial applications
- Easier and more cost-effective installation of the thermowell without any machining of the collar or nozzle compared to the conventional support of the thermowell with support collar
- Optimised root design for improved bending strength



Thermowell model TW10 in ScrutonWell® design

Description

In order to avoid any damage to the thermowell during operation due to mechanical loads, a wake frequency calculation per ASME PTC 19.3 TW-2016 is recommended for critical process conditions. In case of a calculation with negative results, the only constructive solution so far was to shorten the thermowell stem or to increase the root and tip diameter, accepting a longer response time of the thermometer. The only other alternative up to now was to use a support collar to stabilise the thermowell stem inside the flange nozzle. This variant required an on-site machining of the collar to assure an interference fit in flange nozzles.

The ScrutonWell® design reduces the amplitude of oscillation by more than 90 % ¹⁾ and allows an easy and fast installation of the thermowell without support collar, and thus without

expensive and time-consuming rework on site. The WIKA ScrutonWell® design has been tested and approved by the independent laboratories TÜV NEL (Glasgow) and the Institute for Mechanics and Fluid Dynamics (Technical University of Freiberg).

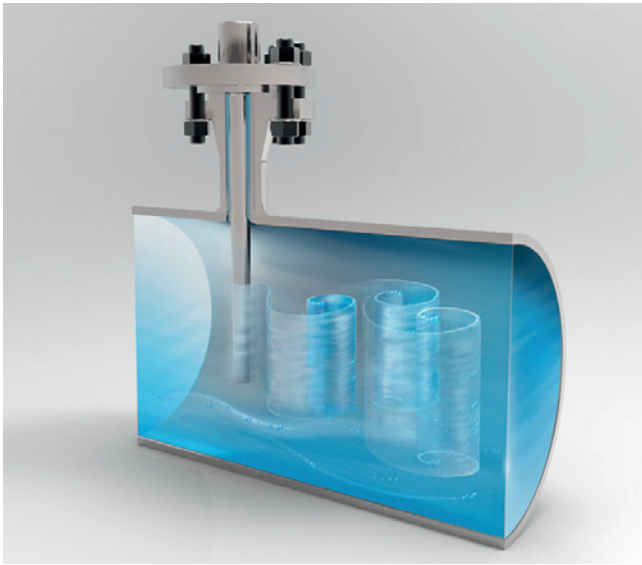
The ScrutonWell® design can be used for all kind of solid-machined thermowells with flange connection, in Vanstone design or for weld-in or screwed process connection.

This helical design has been used successfully for decades in a wide variety of industrial applications to effectively suppress vortex induced vibration (VIV).

1) Journal of Offshore and Mechanics and Arctic Engineering Nov 2011, Vol 133/041102-1 by ASME

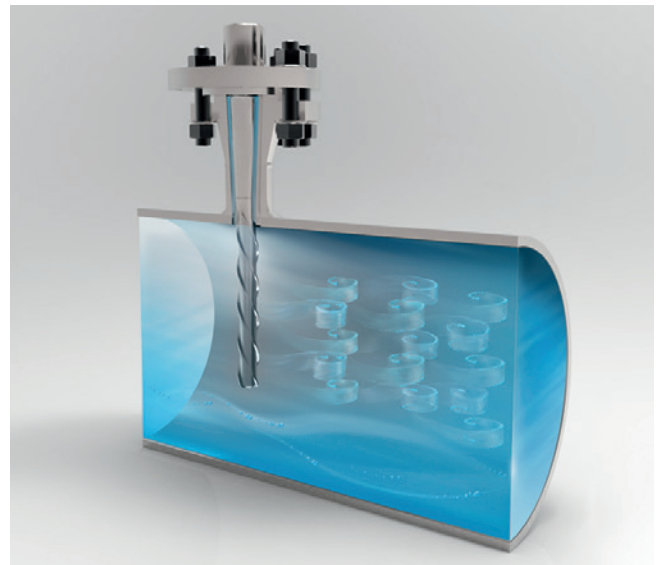
Functional principle

Standard thermowell



In certain flow conditions, a Kármán vortex street can form behind the thermowell stem when it is subjected to a flow within a pipeline. This vortex street consists of two rows of vortices with opposite directions of rotation, which detach themselves to the left and the right of the thermowell out of phase, and this can instigate the thermowell to vibrate.

Thermowell in ScrutonWell® design



The helical coils, arranged around the thermowell stem of the ScrutonWell® design, break up the flow and thus impede the formation of a clearly defined Kármán vortex street. Through the reduced amplitudes of the diffused vortices, vibrational excitation of the thermowell is avoided.

Advantages of the ScrutonWell® design for the user

- Reducing the amplitude of oscillation by more than 90 % compared to conventional stem designs
- The effectiveness of the ScrutonWell® design for thermowells has been verified by independent laboratory testing of TÜV NEL (Glasgow) and TU Freiberg
- Easy, fast and trouble-free installation of the thermowell without rework
- Implementation of a globally established technical solution for thermowells
- Suitable for high flow rates in pipelines with small nozzle connections
- Optimised response time of the thermometer compared to the conventional thermowell design through enlarged surface
- Eliminating the use of support collars
- Easy dismounting comparable to maintaining a standard thermowell
- Dimensioning and calculation of the thermowells based on the static results of ASME PTC 19.3 TW-2016

Specifications

Versions

- Solid-machined version with massive strakes
- Solid-machined version with welded filler rods

Materials

- Stainless steel 304/304L, 316/316L or 1.4571
- Carbon steel A105 or 1.0460
- Special materials like Monel 400 or Inconel 600 on request

Process connection

- Flanges to all standards (e.g. ASME, API, EN, DIN, JIS, GOST)
- Vanstone design for 1", 1 1/2" and 2" nozzle
- Threaded connections ¹⁾ with 1" NPT, 1 1/4" NPT, 1 1/2" NPT or 2" NPT on request
- Weld-in connection ¹⁾ for nozzle or direct welded thermowells on request

1) Dimensions and design of stem are defined by WIKA sales quotation.

Calculation of ScrutonWell® design based on ASME PTC 19.3 TW-2016 (static)

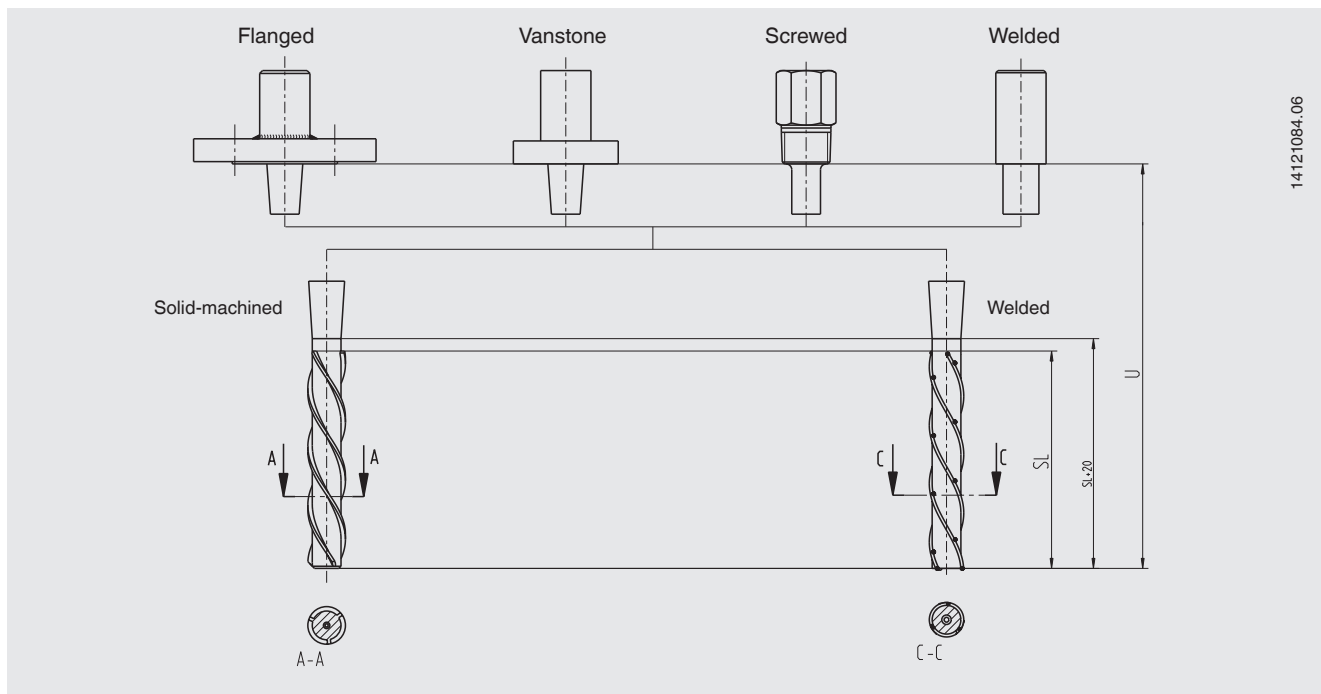
- Maximum permissible pressure load with original tip diameter
- Maximum permissible bending load taking into account modified stem dimensions
- The dynamic part of the wake frequency calculation is not required because of the damping of the oscillation by more than 90 %.

For more details see special article "Helical strakes in suppressing vortex-induced vibrations" (ASME report 11/2011 Vol. 133)

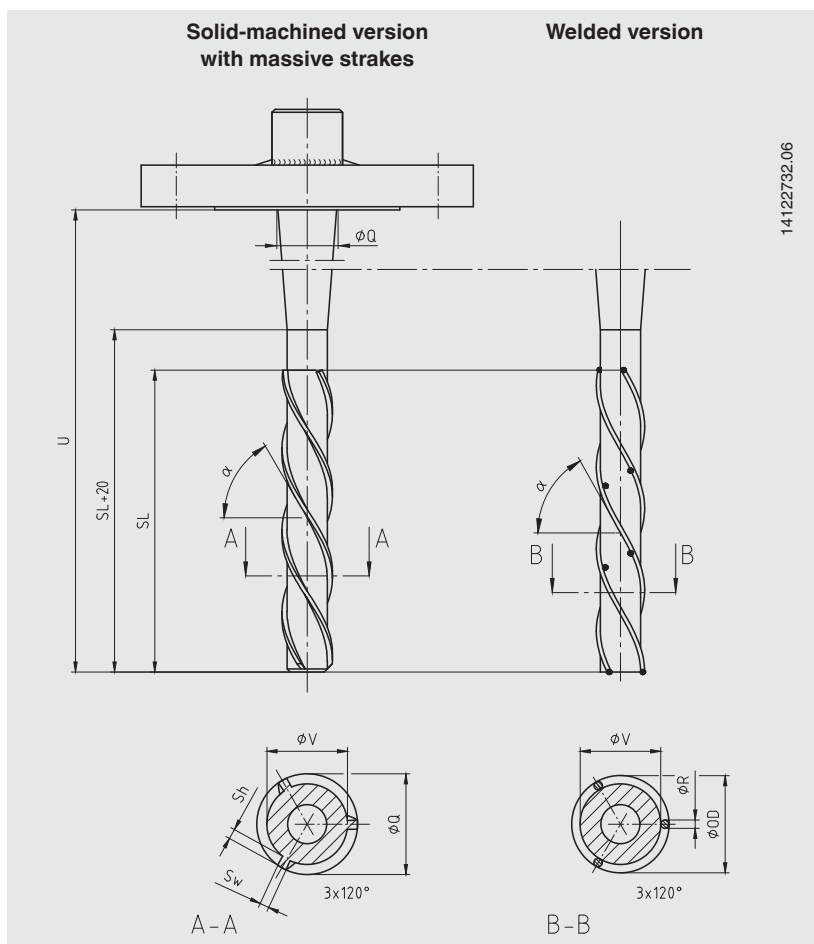
Patents, property rights

Thermowell with vibration reduction according to Scruton (no. PCT/EP2019/071397)

Versions



Dimensions in mm [in]



Legend:

U	Insertion length
SL	Scruton length
α	Pitch angle (standard = 58°)
\varnothing OD	Outer diameter
\varnothing Q	Root diameter
\varnothing V	Tip diameter
Sh	Strake height
Sw	Strake width
\varnothing R	Rod diameter

ScrutonWell® (solid-machined) for flanged and Vanstone thermowells

Dimensions in mm [in]	Root diameter	Tip diameter	Strake height	Strake width	Scruton length ¹⁾	Insertion length ¹⁾
	\varnothing Q	\varnothing V	Sh	Sw	SL	U
1" nozzle schedule 5 ... 80	24 [0.945"]	17 [0.669"]	2.5 [0.098"]	2.5 [0.098"]	max. 800 mm [31.5"]	max. 1,000 mm [39"]
1 ½" nozzle schedule 5 ... 160	30 [1.181"]	20 [0.787"]	2.5 [0.098"]	2.5 [0.098"]	max. 800 mm [31.5"]	max. 1,000 mm [39"]
2" nozzle schedule 5 ... 160	30 [1.181"]	20 [0.787"]	2.5 [0.098"]	2.5 [0.098"]	max. 800 mm [31.5"]	max. 1,000 mm [39"]

ScrutonWell® (welded design) for flanged and Vanstone thermowells

Dimensions in mm [in]	Root diameter	Outer diameter (approx.)	Tip diameter	Rod diameter	Scruton length ¹⁾	Insertion length ¹⁾
	\varnothing Q	\varnothing OD	\varnothing V	R	SL	U
1" nozzle schedule 5 ... 80	24 [0.945"]	22 [0.866"]	17 [0.669"]	2.4 [0.094"]	max. 800 mm [31.5"]	max. 1,000 mm [39"]
1 ½" nozzle schedule 5 ... 160	30 [1.181"]	25 [0.984"]	20 [0.787"]	2.4 [0.094"]	max. 800 mm [31.5"]	max. 1,000 mm [39"]
2" nozzle schedule 5 ... 160	30 [1.181"]	25 [0.984"]	20 [0.787"]	2.4 [0.094"]	max. 800 mm [31.5"]	max. 1,000 mm [39"]

1) Given Scruton length SL and insertion length U are standard lengths. For longer thermowells please contact the manufacturer.

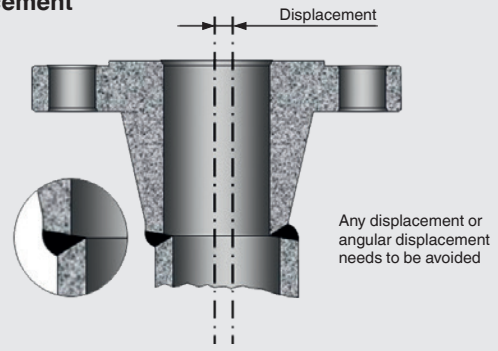
Installation

Installing a thermowell with ScrutonWell® design is identical to installing a comparable standard thermowell. No time-consuming and expensive rework at the nozzle or thermowell adjustment is required for assuring an interference fit, as is the case with the installation of a thermowell with support collar.

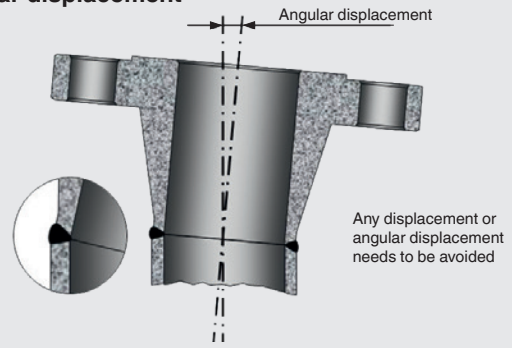
Even flange nozzles with an axial or angular displacement have little influence on the installation of a thermowell with ScrutonWell® design. The use of a thermowell with ScrutonWell® design in certain applications such as scaling, excessive pulsation or mechanical resonance is to be avoided. Contact WIKA to discuss your requirements.

For further information, see Technical information IN 00.15 and IN 00.26.

Displacement



Angular displacement



Application examples

- Offshore platforms
- Industrial chimneys
- Car antenna



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